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Spasticity, what's the goal? Assessment, rehabilitation and future perspectives.

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Alteration to motor performance following central neurological injury is a common clinical feature often characterised by weakness. Weakness and reduced motor control are important contributors to reduced activity level function in these individuals. However, spasticity is a further feature, which may contribute to disability and be a distressing symptom.

The upper motor neurone (UMN) syndrome is a result of damage to the central nervous system and consists of what are termed positive features, such as spasticity and negative features, such as weakness. Spasticity has been defined as a motor disorder and one component of the UMN syndrome by Lance (Lance 1980). The EU-SPASM group have addressed some of the limitations of the narrower definition by Lance, and have incorporated both motor and sensory elements, resulting in a definition of “disordered sensorimotor control, resulting from an upper motor neurone lesion, presenting as intermittent or sustained involuntary activation of muscles” (Pandyan et al. 2005). Data on the prevalence of spasticity are varied, but it has been reported in between 38% and 42% of patients after stroke (Urban et al. 2010; Sommerfeld et al. 2011), 13% in traumatic brain injury and 41 to 66% in people with Multiple Sclerosis (Martin A et al. 2014).

Spasticity may present a significant clinical problem in terms of limiting function at the level of activity performance by the individual, otherwise known as ‘active function’ (Sheean 2001). Alternatively it may impact on carrying out care tasks by a caregiver or by the person themselves to a paretic limb, otherwise known as ‘passive function’ (Sheean 2001). Spasticity can also have further negative symptomatic implications such as pain.

Many individuals with central nervous system damage may exhibit elements of spasticity and other associated features of the UMN syndrome, but this doesn’t always require intervention. In some instances spasticity may actually be useful, for example enabling standing on an otherwise weak leg. The key element in management is therefore to ask, ‘what will be gained with intervention?’ or to put the question another way ‘what is the goal?’

Assessment

Assessment of spasticity is commonly undertaken using clinician reported measures such as the Modified Ashworth Scale (MAS) or the Tardieu Scale (TS). These methods have limitations due to challenges with both validity and reliability. The MAS in particular conflates resistance to passive stretch with spasticity, when spasticity is only one factor impacting on resistance. Both scales, when tested also have limited inter-rater reliability. Quantification of resistance to passive stretch using force measurement and evaluation of associated muscle activity using electromyogram has been demonstrated. These methods have limitations for application in daily clinical practice due to the time and equipment required. However these assessments are becoming more clinically accessible, and maybe more practical for use in the future.

Goal attainment scaling is increasingly used as a method to plan treatment and evaluate outcome of focal treatment for limb spasticity (Ashford and Turner-Stokes 2006; Ashford and Turner-Stokes 2009; Turner-Stokes et al. 2010). Goals for treatment of spasticity are widely diverse, depending on the individual aspirations and priorities of the patient and/or their family. They may be directed at reducing impairment (e.g. preventing contractures and deformity), improving activities (such as personal care) or use of the limb for participatory activities (such as work, hobbies, recreation etc.). In other words, goals may be directed at achieving change at any level of the World Health Organisation (WHO) International Classification of Function, Disability and Health (ICF), but most commonly in activity for both passive and active function.

Goal Attainment Scaling has now been used as the primary outcome measure in two large multi-centre trials of focal spasticity intervention in the upper limb, the BEST study (Ward AB et al. 2014) and the ULIS II study (Turner-Stokes et al. 2013). Through these studies GAS demonstrated clinically important change in outcome for people with upper limb spasticity following intervention.

Goal setting is only one element of treatment planning and outcome evaluation. In addition to detailed goal setting and attainment, it is also key to quantify improvements against relevant standardised measures. This then enables not only evaluation of goal attainment, but quantification of goal improvements against a recognised, often patient-reported, measure of functional change.

Rehabilitation

Alongside the systematic setting and evaluation of patient-directed goals, understanding what treatment is received and how it is best applied is essential to achieving the best outcomes. There is still limited understanding of the combined, complex intervention provided in the physical rehabilitation of those with spasticity. To deliver 'best practice' it is key that we examine which interventions are used and work best to begin to develop a clearer model of practice. In spasticity and associated contracture management, this issue becomes challenging when a combination of multiple physical and pharmacological interventions are often used and relate to the wider rehabilitation that individuals receive, not just the direct management of spasticity.

Evaluation of which treatments are used and effective in practice for spasticity management is therefore important to model, before further formal evaluation of those treatments can be undertaken in this context. Categorisation of goals for focal spasticity intervention has identified consistent goal areas which may be associated with particular types of physical intervention (Ashford et al. 2015). Achievement of spasticity treatment goals which are categorised to 'passive function' improvement, may be associated with stretch interventions such as serial casting, whereas for 'active function' improvements, practicing functional tasks maybe the key element. A previous Cochrane review identified 'low level' evidence for the effectiveness of outpatient rehabilitation in improving active function and impairments following botulinum toxin for upper limb spasticity in adults with chronic stroke (Demetriou et al. 2013). In a further Cochrane review evaluating non pharmacological interventions for spasticity in multiple sclerosis, there was also 'low level' evidence for physical activity programmes used in isolation or in combination with other interventions (pharmacological or non-pharmacological) in improving outcomes (Amatya et al. 2013). Further research is however required before firm conclusions can be drawn.

A trial to evaluate 'self-rehabilitation' (i.e. independent practice) for gait rehabilitation in those with chronic stroke and spasticity has suggested that a standardised self-rehabilitation programme constitutes a useful approach with enhanced outcome when supported by botulinum toxin administration (Roche et al. 2015). This gives some additional support that at

least for goals directed at 'active function' task performance such as walking, therapy focused on practicing this is critical to goal achievement.

Future perspectives

A theoretical framework, possibly based around the selected goals for treatment, might be one way of modelling when certain interventions should be applied. Cohort studies evaluating 'real-life' practice, with detailed capture of therapy interventions and how they are applied could then be linked back to the goal category for intervention. With sufficient participant numbers, over time, a more complete model of when different types of physical intervention should be applied and the costs of providing these should be possible to generate. It then becomes possible and useful to evaluate these complex interventions through randomised controlled trial methodology.

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References

- Amatya, B, Khan, F, La Mantia, L, Demetrios, M and Wade, DT (2013). "Non pharmacological interventions for spasticity in multiple sclerosis." *Cochrane Database of Systematic Reviews*(2).
- Ashford, S, Jacinto, J, Fheodoroff, K and Turner-Stokes, L (2015). "Common goal areas in the treatment of upper limb spasticity: a multicentre analysis, ." *Clinical Rehabilitation*. DOI: **10.1177/0269215515593391**.
- Ashford, S and Turner-Stokes, L (2006). "Goal attainment for spasticity management using botulinum toxin." *Physiotherapy Research International* **11**(1): 24-34.
- Ashford, S and Turner-Stokes, L (2009). "Management of shoulder and proximal upper limb spasticity using botulinum toxin and concurrent therapy interventions: A preliminary analysis of goals and outcomes." *Disability and Rehabilitation* **31**: 220-226.
- Demetrios, M, Khan, F, Turner-Stokes, L, Brand, C and McSweeny, S (2013). "Multidisciplinary rehabilitation following botulinum toxin and other focal intramuscular treatment for post-stroke spasticity." *Cochrane Database of Systematic Reviews*.
- Lance, JW (1980). Symposium synopsis. Spasticity: disordered motor control. Feldman, RG, Young, RR, Koella, WP and (editors). Chicago:, Yearbook Medical Publishers: 465-494.
- Martin A, Abogunrin S, Kurth H and Dinet J (2014). "Epidemiological, humanistic and economic burden of illness of lower limb spasticity in adults: a systematic review. ." *Neuropsychiatr Dis Treat* **10**: 111-122.
- Pandyan, AD, Gregoric, M, Barnes, MP, Wood, D, van Wijck, F, Burridge, J, Hermens, H and Johnson, GR (2005). "Spasticity: clinical perceptions, neurological realities and meaningful measurement." *Disability and Rehabilitation* **27**: 2-6.
- Roche, N, Zory, R, Sauthier, A, Bonnyaud, C, Pradon, D and Bensmail, D (2015). "Effect of rehabilitation and botulinum toxin injection on gait in chronic stroke patients: a randomized controlled study." *Journal of Rehabilitation Medicine* **47**(1): 31-37.
- Sheean, GL (2001). "Botulinum treatment of spasticity: Why is it difficult to show a functional benefit?" *Trauma and Rehabilitation*: 771-776.
- Sommerfeld, DK, Johansson, H, Jonsson, A-L, Murray, V, Wessari, T, Holmqvist, LW and von Arbin, M (2011). "Rivermead mobility index can be used to predict length of stay for elderly persons, 5 days after stroke onset." *Journal of Geriatric Physical Therapy* **34**(2): 64-71.
- Turner-Stokes, L, Baguley, I, De Graaff, S, Katrak, P, Davies, L, McCrory, P and Hughes, A (2010). "Goal attainment scaling in the evaluation of treatment of upper limb spasticity with botulinum toxin: A secondary analysis from a double-blind placebo-controlled randomised clinical trial." *Journal of Rehabilitation Medicine* **42**: 81-89.
- Turner-Stokes, L, Fheodoroff, K, Jacinto, J and Maisonobe, P (2013). "Results from the Upper Limb International Spasticity Study-II (ULIS-II): a large, international, prospective cohort study investigating practice and goal attainment following

- treatment with botulinum toxin A in real-life clinical management " BMJ Open
doi:10.1136/bmjopen-2013-002771
- Urban, P, Wolf, T, Uebele, M, Marx, J, Vogt, T, Stoeter, P, Bauermann, T, Weibrich, C, Vucurevic, G, Schneider, A and Wissel, J (2010). "Occurence and clinical predictors of spasticity after ischemic stroke." *Stroke* **41**(9): 2016-2020.
- Ward AB, Wissel J, Borg J, Ertzgaard P, Herrmann C, Kulkarni J, Lindgren K, Reuter I, Sakel M, Säterö P, Sharma S, Wein T, Wright N, Fulford-Smith A and BEST Study Group (2014). "Functional goal achievement in post-stroke spasticity patients: the BOTOX® Economic Spasticity Trial (BEST)." *Journal of Rehabilitation Medicine* **46**(6): 504-513.